AMENDMENTS TO THE CLAIMS

1. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 7,

wherein said control section comprises:

a first detector configured to detect said current actual deviation;

a deviation holding section configured to hold said current target deviation;

a steering angle holding section configured to hold said current target steering angle;

a control calculating section configured to generate said provisional steering angle based on said current target deviation, said current actual deviation and said current target steering angle; and

said optimization calculating section.

2. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 1, wherein said running route is set on a road surface, and said deviation holding section comprises a second detector configured to detect said current target deviation from said running route in a non-contact manner.

3. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 1, wherein said deviation holding section comprises:

a position calculating section provided on said vehicle main body, and configured to determine said current position of said vehicle by integrating a velocity data of said vehicle and to determine said current target deviation based on said current position of said vehicle.

4. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 1, wherein said running route is set on a road surface and comprises an output section configured to output said current position without contact, and

said control section comprises a receiver configured to receive said current position from said output section.

5. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 4, wherein said target steering angle is written in said running route, and

said receiver receives said target steering angle from said output section.

6. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 3, wherein said control section further comprises:

a velocity detector configured to detect a velocity of said vehicle.

7. (Previously presented) A vehicle guided along a running route without contact with a guide rail, comprising:

wheels;

a cart supported by said wheels;

a vehicle main body supported by said cart; and

a steering control system which comprises a control section and a drive section, and

wherein said control section generates a provisional steering angle based on a current target deviation from a running route at a current position of said vehicle, a current actual deviation from said running route at said current position of said vehicle, and a current target steering angle at said current position of said vehicle,

said control section comprises:

an optimization calculating section configured to convert said provisional target steering angle to a target control steering angle by adding a correction steering angle based on a steering angle prediction correction to minimize vibration of said vehicle resulting from a steering of said vehicle, and

said drive section mechanically steers said cart based on said target control steering angle.

8. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 1, wherein said optimization calculating section comprises:

a steering angle correction generating section configured to determine a current optimal steering angle at said current position of said vehicle and a future optimal steering angle

corresponding to a future position of said vehicle based on said current steering angle, and to generate a correction steering angle based on a difference between said current target deviation and said current actual deviation, said current optimal steering angle, and said future optimal steering angle; and

a correction adding section configured to generate said control steering angle by adding said provisional steering angle, and said correction steering angle.

9. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 8, wherein said optimization calculating section further comprises:

a current steering angle detector configured to detect said current steering angle corresponding to said current position; and

an optimal solution calculating section configured to determine said current optimal steering angle and said future optimal steering angle from all or a part of said current steering angles for N times when said vehicle ran said running route N times, and

said optimal solution calculating section determines said current optimal steering angle and said future optimal steering angle such that the vibration resulting from the steering of said vehicle is minimized.

10. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 9, wherein said optimal solution calculating section comprises a neural network configured to determine said correction steering angle from said difference between said current target deviation and said current actual deviation and said current steering angle.

11. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 9, wherein said optimal solution calculating section executes a program to determine said correction steering angle based on genetic algorithm.

12. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 10, wherein said optimal solution calculating section executes a program to determine said correction steering angle based on genetic algorithm.

13. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 1, wherein said deviation holding section comprises a position detector configured to detect said current position of said vehicle.

14. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 7, wherein when a difference between said current position of said vehicle in a m-th run of said running route and said current position of said vehicle in an n-th run of said running route is given as an amplitude, said optimization calculating section determines said correction steering angle such that a sum of squares of the amplitudes for optional combinations of m and n is minimized.

15. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 13, wherein

said optimization calculating section determines said correction steering angle such that a sum of squares of the accelerations in m times running on said running route is minimized.

16. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 7, further comprising:

a safety bar supported by said cart,

said drive section is interposed between said cart and said wheels, and

a displacement portion of said drive section is mechanically connected with said wheels and said safety bar.

17. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 16, wherein said displacement portion is a ball screw driven by a motor or a nut connected to said ball screw.

18. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 16, wherein said displacement portion is a cylinder driven with a fluid pressure source or a piston rod connected to said cylinder.

19. (Previously presented) A vehicle guided along a running route without contact with a guide rail, comprising:

wheels;

a cart supported by said wheels; and

a steering apparatus which comprises a control section and a drive section, and

wherein said control section generates a provisional steering angle based on a current target deviation from a running route at a current position of said vehicle, a current actual deviation from said running route at said current position of said vehicle, and a current target steering angle at said current position of said vehicle, and optimize said provisional target steering angle to a control steering angle to minimize vibration of said vehicle resulting from a steering of said vehicle, and

said drive section mechanically steers said cart based on said target control steering angle,

said drive section comprises:

a motor;

a screw axis connected with an output axis of said motor;

bearings configured to support said screw axis;

a nut screwed with said screw axis;

a first support configured to support said nut;

a second support configured to support said bearings; and

a link mechanism configured to steer said wheels, and

either of said first support and said second support constitutes a fixation side support fixed to said cart, and either of said first support and said second support constitutes a movable side support connected with said link mechanism.

20. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 19, further comprising:

a safety bar; and

safe rings supported by the safety bar, and

said safety bar is connected with said movable side support,

said cart is connected with said fixation side support, and

said nut is supported by the cart.

21. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 20, wherein said motor and said bearings are supported by said safety bar.

22. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 20, wherein said steering apparatus further comprises:

a clutch interposed between said screw axis and said motor, and

connection of said clutch is released in response to contact of said safe rings and said rail side fixed object.

23. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 20, wherein said nut is supported by said link mechanism, and said motor and said bearings are supported by said cart.

24. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 20, wherein said screw axis constitutes a ball screw axis.

25. (Previously presented) A vehicle guided along a running route without contact with a guide rail, comprising:

wheels;

a cart supported by said wheels, and

a steering unit which comprises a control section and a drive section, and

wherein said control section generates a provisional steering angle based on a current target deviation from a running route at a current position of said vehicle, a current actual deviation from said running route at said current position of said vehicle, and a current target steering angle at said current position of said vehicle, and optimize said provisional target steering angle to a control steering angle to minimize vibration of said vehicle resulting from a steering of said vehicle, and

said drive section mechanically steers said cart based on said target control

steering angle,

said drive section comprises:

a motor;

a movable body connected with an output axis of said motor;

a safety bar provided with safe rings, and

a link mechanism configured to steer said wheels,

said link mechanism is connected with said safety bar and said movable body, and

said safety bar is movably supported to said cart, and said motor is fixedly supported by said cart.

26. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 25, wherein said output axis of said motor is connected with a movable body via a pinion and a rack.

27. (Previously presented) A vehicle guided along a running route without contact with a guide rail, comprising:

wheels;

a cart supported by said wheels; and

a steering unit which comprises a control section and a drive section, and

wherein said control section generates a provisional steering angle based on a current target deviation from a running route at a current position of said vehicle, a current actual deviation from said running route at said current position of said vehicle, and a current target steering angle at said current position of said vehicle, and optimize said provisional target steering angle to a control steering angle to minimize vibration of said vehicle resulting from a steering of said vehicle, and

said drive section mechanically steers said cart based on said target control steering angle,

said drive section comprises:

a motor;

a screw axis connected with an output axis of said motor; bearings configured to support said screw axis;

a nut screwed in said screw axis;

a link mechanism configured to steer said wheels; and

a safety bar provided with safe rings,

said safety bar, said motor, and said bearings are fixedly supported by said cart, and

said nut is connected with said link mechanism.

28. (Previously presented) The vehicle guided along a running route without contact with a guide rail according to claim 27, wherein said steering unit further comprises:

a clutch interposed between said screw axis and said motor, and

connection of said clutch is released in response to a contact of said safe rings and said rail side fixed object.

29. (Previously presented) A method of steering a vehicle guided along a running route without contact with a guide rail, comprising:

setting of a 1-dimensional coordinate data of a target route, the 1-dimensional coordinate data comprising a sequence of position data of the target route;

setting of a target steering angle corresponding only to said 1-dimensional coordinate data [X_j],

detecting a current deviation between said target routes and a current position of a vehicle main body;

generating a control steering angle corresponding to said current deviation and said target steering angle; and

turning orientation of wheels to an angle position corresponding to said control steering angle, and

wherein said current deviation is defined as a distance of said current position in a direction orthogonal to said target route.

30. (Original) The steering method according to claim 29, further comprising:

setting a future target steering corresponding to a future position on said target route; and

generating a correction steering angle corresponding to the future steering angle, and

wherein said control steering angle is determined based on said current deviation, said target steering angle, and said correction steering angle.

31. (Canceled)